

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims

1.-34. (Canceled)

35. (Currently amended) A method for ~~selecting~~ determining an endpoint indicator in plasma processing, the method comprising:

providing ~~at least a first RF a~~ signal having a ~~first fundamental frequency and a second RF signal having a second fundamental frequency~~;

etching, in a plasma processing chamber, at least one sample substrate using the ~~first RF signal and the second RF signal~~;

determining at least one calibrating endpoint by performing an empirical analysis on the at least one sample substrate;

etching, in the plasma processing chamber, at least one test substrate using ~~the first RF signal and the second RF~~ one or more signals having the frequency, the at least one test substrate being etched for at least one time duration beyond the at least one calibrating endpoint;

measuring a plurality of parameters over at least one time range when etching the at least one test substrate, the at least one time range including the at least one calibrating endpoint, at least a start point of the at least one time range is delayed relative to at least a start point of the at least one time duration;

comparing data pertaining to at least a ~~first plurality of harmonics for the plurality of parameters and a second plurality of harmonics for the plurality of parameters~~, the ~~first plurality of harmonics representing frequency harmonics of said first fundamental frequency and the second plurality of harmonics representing harmonics of the second fundamental frequency~~, the data pertaining to at least sensitivity of the ~~first plurality of harmonics for the plurality of parameters and the second plurality of harmonics for the plurality of parameters~~ responsive to the at least one calibrating endpoint; and

selecting the endpoint indicator based on the comparing, the endpoint indicator including a selected harmonic ~~for a selected one of the first fundamental frequency and the second fundamental frequency~~ for a select parameter of said plurality of parameters.

36. (Currently amended) The method of claim 35 wherein the at least one time range is ~~predefined and is less than a time duration required to etch the test substrate~~ ends earlier than the at least one time duration and forms a time window around an expected endpoint, the expected endpoint determined based on the at least one calibrating endpoint.

37. (Canceled).

38. (Previously Presented) The method of claim 35 wherein the empirical analysis includes a scanning electron microscopy analysis.

39. (Previously Presented) The method of claim 35 wherein the select parameter represents one of current, voltage, and phase.

40. (Canceled).

41. (Previously Presented) The method of claim 35 wherein the select parameter is measured at one or more of an upper electrode and a lower electrode of a system for the plasma processing.

42. (Previously Presented) The method of claim 35 wherein the select parameter is measured at both of an upper electrode and a lower electrode of a system for the plasma processing.

43. (Canceled).

44. (Previously Presented) The method of claim 35 further comprising verifying the endpoint indicator by performing a further empirical analysis.

45. (Currently Amended) A method for detecting an endpoint in plasma processing that employs a ~~plurality of RF signals having a plurality fundamental frequencies~~ frequency, the method comprising:

etching a at least one sample substrate using ~~the plurality of RF signals~~ at least one signal having the frequency;

determining a calibrating endpoint by performing an empirical analysis on ~~an~~ at least one etched location of the at least one sample substrate;

etching at least one test substrate using ~~the plurality of RF signals~~ one or more signals having the frequency, the at least one test substrate being etched for at least one time duration beyond the calibrating endpoint;

measuring a plurality of parameters over a time range when processing the at least one test substrate, the time range including the calibrating endpoint;

comparing data pertaining to a plurality of harmonics of the frequency ~~plurality of fundamental frequencies~~ for the plurality of parameters, the data pertaining to the calibrating endpoint;

selecting a ~~given~~ harmonic of ~~a given fundamental~~ the frequency for a ~~given~~ parameter from the plurality of harmonics of the frequency ~~plurality of fundamental frequencies~~ for the plurality of parameters as an endpoint indicator based on the comparing, wherein a signal representing the harmonic of the ~~given fundamental~~ frequency for the ~~given~~ parameter is selected from a plurality of signals representing the plurality of harmonics of the frequency ~~plurality of fundamental frequencies~~ for the plurality of parameters as ~~being the signal with~~ having the most discernible repeatable response pertaining to ~~said~~ the calibrating end point;

setting at least one criterion pertaining to the ~~given~~ harmonic of the ~~given~~ ~~fundamental~~ frequency for the ~~given~~ parameter for indicating the endpoint;

etching a production substrate at the ~~given~~ frequency;

determining a time window around an expected endpoint, the expected endpoint determined based on the calibrating endpoint, the time window being less than the at least one time duration;

monitoring the ~~given~~ harmonic of the ~~given fundamental~~ frequency for the ~~given~~ parameter within the time window when etching the production substrate; and

signaling the endpoint when the at least one criterion is met.

46. (Currently amended) The method of claim 45 wherein the ~~given~~ parameter represents one of current, voltage, and phase.

47. (Currently amended) The method of claim 45 wherein the at least one criterion includes presence of a trough in a waveform of the ~~given~~ harmonic of the ~~given fundamental~~ frequency for the ~~given~~ parameter.

48. (Currently amended) The method of claim 45 wherein the monitoring includes measuring the ~~given~~ parameter at one or more of an upper electrode and a lower electrode of a system for the plasma processing.

49. (Currently amended) The method of claim 45 wherein the monitoring includes measuring the ~~given~~ parameter at both of an upper electrode and a lower electrode of a system for the plasma processing.

50. (Currently amended) The method of claim 45 wherein the ~~time range is predefined and is less than a time duration required to etch the at least one test substrate~~ monitoring is not performed before the time window.